

BC Ministry of Environment

Reclaimed Water Guideline

A Companion Document to the Municipal Wastewater Regulation

Made Under the *Environmental Management Act*

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1. Disclaimer

This guideline includes generalised information and examples which may not address or reflect all site specific constraints related to the application of reclaimed water.

A qualified professional (QP) must assess each project on a case by case basis to ensure the requirements of the Municipal Wastewater Regulation (MWR) are met and public health is protected and maintained at all times.

If discrepancies exist between this guideline and provincial legislation or regulations, the legal instruments prevail.

Compliance with the MWR and this guidance document does not necessarily ensure compliance with other applicable federal, provincial, or municipal legislation.

Due to periodic updating of the MWR, the sections referenced in this guideline may become out of date. The most current version of the regulation and relevant section should be referenced.

Prior to using a document referenced in this guideline, the user should confirm it is the most recent version as publications are amended from time to time by their respective owners.

2. Glossary of Terms

“beneficial” means advantageous or helpful in enhancing or protecting the environment, increasing conservation of natural resources, or improving biological or physical processes without any negative impact on human health or the environment.

“director”, “regional director” or “MoE regional director” means the Ministry of Environment’s regional director or his or her designate in the area where reclaimed water will be used. Where information needs to be submitted to a regional director, the information is typically submitted through the regional environmental protection officer (see below). Regional directors operate under the *Environmental Management Act*.

“effluent” or “municipal effluent” see the Municipal Wastewater Regulation.

“electrical conductivity” (EC) is used in the determination of salinity (see below). EC is typically measured in deci-Siemens/metre (dS/m) at 25° Celsius.

“environmental protection officer” or “MoE regional case manager” is the Ministry of Environment’s representative overseeing the registration of a reclaimed water use. Environmental protection officers operate under the *Environmental Management Act*.

“health officer”, “local health officer” or “environmental health officer” is the health officer representing the local health authority where reclaimed water will be used. Health officers operate under the *Public Health Act*.

“municipal wastewater” see the Municipal Wastewater Regulation.

“reclaimed water” see the Municipal Wastewater Regulation.

“salinity” means the saltiness of soil measured by electrical conductivity (EC) and by the sodium adsorption ratio (SAR). Soils high in soluble salts are referred to as saline. A saline soil has an EC greater than 4 dS/m and a SAR of less than 13. Salinity affects the growth of many crops.

“sodicity” means the effect a high sodium water source has on soil structure. Soil sodicity is measured by electrical conductivity (EC) and by the sodium adsorption ratio (SAR). A sodic soil has an EC of less than 4 dS/m and a SAR greater than 13.

“Sodium adsorption ratio (SAR)” is a measure of the amount of sodium relative to the amount of calcium and magnesium in water or a soil solution. The SAR can be used to predict the exchangeable sodium percentage of a soil equilibrated with a given solution.

3. Guideline

The purpose of this guideline is to serve as a companion document to the MWR to help ensure beneficial reclaimed water projects comply with the regulation. This document is intended for providers,

users, qualified professionals, technology suppliers, and government agencies involved in reclaimed water projects.

4. Authorisation

4.1 Authorisation Instruments

In order to be in compliance with the *Environmental Management Act (EMA)*, a provider or discharger of reclaimed water in BC must be authorised by one of the following regulatory instruments:

- An approved Liquid Waste Management Plan (LWMP)
- A registration under the MWR
- A permit
- A temporary approval

4.2 Liquid Waste Management Plans

LWMPs enable local governments to develop flexible, community specific solutions for municipal wastewater discharges and reclaimed water uses.

Elector participation through public review and consultation is an essential part of developing a LWMP and must occur before a plan will be approved by the Minister of Environment.

Effluent and reclaimed water standards for facilities captured by a LWMP are expected to meet or exceed MWR requirements.

For additional information on the planning process, please refer to the [Guidelines for Preparing Liquid Waste Management Plans](#) available on the Ministry of Environment's website.

4.3 Municipal Wastewater Regulation

The MWR is a comprehensive regulation governing all aspects of municipal wastewater management in BC, including the use of reclaimed water. The MWR is the focus of this guideline.

The regulation replaces the former Municipal Sewage Regulation (MSR) and was developed in consultation with a wide group of stakeholders.

Registration and compliance with the MWR allows a discharger to discharge or provide reclaimed water under the *Environmental Management Act*.

A registration under the MWR must not conflict with an approved LWMP.

Application of MWR

The MWR applies to all reclaimed water uses except reclaimed water from a sewerage system that serves only a single family residence or duplex.

MWR also applies to discharges to ground and water. For details, please refer to the Application section of MWR. Where a project will discharge reclaimed water to ground or water, the MWR requirements for those types of discharges will apply.

Registration effective date

A registration under the MWR is only considered effective when written notification is received from the Ministry of Environment (MoE) regional director. Reclaimed water must not be used or distributed prior to the registration being effective.

Construction of a wastewater facility must not begin until the effective date of registration, or until notification is received from the regional director indicating that construction may begin.

Minimum standards

The requirements for reclaimed water use prescribed in the MWR are minimum standards. Where more stringent requirements are necessary to protect public health or the receiving environment, the qualified professional must identify these additional requirements in the Environmental Impact Study (EIS) and address them in the design of the proposed project.

4.4 Permits

With the introduction of a regulation governing municipal wastewater discharges, permits are no longer being issued.

4.5 Temporary Approvals

Temporary approvals may be issued for up to 15 months in very limited circumstances.

4.6 Other Legislation

Please be aware that other municipal, provincial and federal legislation may apply to the various aspects of a reclaimed water project, including local bylaws and federal and provincial building codes.

5. Roles and Responsibilities

Providers of reclaimed water, end users, technology suppliers, qualified professionals, and regulatory agencies all play an important role in ensuring reclaimed water is used safely and in compliance with the MWR.

Providers of Reclaimed Water

Providers of reclaimed water are authorised dischargers providing reclaimed water to end users for beneficial purposes. Providers may include local governments, private companies, cooperatives or individuals.

Providers are expected to be stewards and champions of reclaimed water, and must exercise responsibility, accountability and leadership in protecting public health and the environment.

Unless an agreement is in place indicating otherwise, providers are expected to provide appropriate training, documentation, and guidance information to end users to ensure reclaimed water is used safely and for its intended purpose.

Although the term “provider of reclaimed water” is not defined in the MWR, it can be taken to mean the same thing as “discharger”, i.e. the individual authorised to provide reclaimed water.

Providers are expected to be aware of their obligations under the MWR and are expected to be in compliance with the terms and conditions of the MWR and EMA at all times.

Where applicable, reclaimed water providers must be trained and certified in cross connection control.

End Users of Reclaimed Water

End users are an integral part of the stewardship process and must exercise responsibility and accountability for protecting public health and the environment since they are often the last point of control for reclaimed water before it is used.

It is expected that end users will maintain close communications with their reclaimed water provider and keep up to date with all procedures, training and guidelines for safely using reclaimed water.

End users must abide by all local bylaws and only use reclaimed water for purposes that their reclaimed water provider is expressly authorised for.

End users are expected to be aware of their obligations under the MWR and are expected to be in compliance with the terms and conditions of the MWR and EMA at all times.

Where applicable, end users of reclaimed water must be trained and certified in cross connection control.

Qualified Professional (QP)

The MWR recognises and relies upon QPs for their knowledge, experience and accountability in their specific areas of practice. Environmental impact studies, receiving environment monitoring programs and any plans or technical documentation required under the MWR must be prepared by a QP.

Any portion of the design or construction of a project or works that meets the definition of “practice of professional engineering”, as defined in the *Engineers and Geoscientists Act*, must be designed by a Professional Engineer.

Many projects will require a complement of QPs, each with expertise in their individual fields, in order to properly account for all aspects of a project. The QP team must possess a range of skills that will allow it to properly assess, design and deliver the project.

QPs are expected to follow the precautionary principle when working on reclaimed water projects. Public health and safety and protection of the environment must always be held paramount.

QPs must and adhere to the standards and requirements of the MWR, as well as other applicable guidelines and resources available on the MoE website and amended from time to time, including the *Environmental Impact Study Guideline*.

Where a project requires a higher level of environmental or public health protection than specified in the MWR, a QP must identify these requirements as part of the EIS.

It is expected that QPs will bring to the attention of the MoE regional director any situation where it is believed that the MWR or this guideline may not adequately protect public health or the environment.

QPs are also encouraged to propose improvements to this guideline or the MWR where it is believed that efficiencies can be found or improvements made.

For the definition of “qualified professional” please refer to the definitions section of MWR. Please note that even though “qualified professional” is defined in the MWR, the regulation does not supersede other legislation applicable to individual professions, including the *Engineers and Geoscientists Act*.

Regulatory Agencies

The role of the Ministry of Environment (MoE) with respect to reclaimed water is to set clear environmental protection standards and develop and implement policies, procedures and guidelines for compliance with these standards.

MoE is also responsible for measuring compliance with the MWR and for taking appropriate enforcement action when necessary.

MoE will also consult with other government ministries and agencies where there is an overlap in activities and when developing and implementing regulations. With respect to reclaimed water use, this would include ministries such as Health and Agriculture.

MoE will also consult with outside stakeholders including dischargers, providers, end users, qualified professionals, technology suppliers and the public when developing and implementing regulations.

Technology Suppliers

Technology suppliers are expected to provide wastewater treatment technologies that meet the requirements of the MWR and this guideline, as well applicable bylaws and building codes.

Technology and equipment must be developed on the principles of reliability, efficiency, flexibility, cost effectiveness and ease of long term operation and maintenance.

Equipment should include appropriate documentation and design references to ensure correct installation, operation and maintenance.

When a provider proposes to use a commercially unproven technology as part of a reclaimed water proposal, the MoE regional director will expect to see published performance data and case studies proving the technology to be reliable and capable of meeting the requirements of the MWR.

Even when a new technology is deemed acceptable to the director for the purposes of a registration, the onus remains on the discharger to meet the requirements of the MWR at all times.

6. MWR Registration

6.1 Initial registration

To begin a new registration:

- familiarise yourself with the applicable sections of this guideline and requirements in the MWR and then follow the registration guidance on MoE's website:
<http://www.env.gov.bc.ca/epd/mun-waste/regs/mwr/guidance/reg-msd.htm>
- contact the applicable MoE regional office to arrange a pre-registration meeting:
<http://www.env.gov.bc.ca/epd/main/regions.htm>

Registration requires submission of specific information, as detailed in the sections below and in Part 2 of MWR. Registration takes effect on the date a director notifies the applicant (in writing) that all information has been received in a form and manner acceptable to the director.

Reclaimed water must not be provided, used or discharged prior to the registration being effective. Also, the construction of a wastewater facility (including works that gather, treat, transport, store, use or discharge reclaimed water) must not commence until the earlier of:

- being notified in writing by the regional director that registration is effective, or
- being notified in writing by the regional director that construction may begin

6.2 Health Officer Notification (via email)

6.2.1 Where to Send Notification

Part of the registration process under MWR involves notification and approval by the local health authority. Email the information outlined in the sections below to the applicable health authority.

Fraser Health	feedback@fraserhealth.ca
Interior Health	hbe@interiorhealth.ca
Northern Health	php@northernhealth.ca
Vancouver Coastal	Michael.Wu@vch.ca or Len.Clarkson@vch.ca (alternative)
Vancouver Island	Lynne.Magee@viha.ca

6.2.2 Timelines

Written (email) notification to the health officer must be provided at least 60 days prior to registering a reclaimed water use under the MWR. It is at the discretion of the health officer to determine whether or not the 60 days is considered to have expired.

Upon receiving a notification email for a proposed reclaimed water use, the health officer will likely take one of the following actions:

- indicate by reply email that there are no objections to the proposal. In this case, the 60 days does not need to expire, and the MoE registration process and review may continue.
- request an amendment to the proposal to better suit the community, meet health requirements, or correct a deficiency or concern.
- deny the use on grounds of a public health concern.
- take no action and allow the 60 days to expire, if the application is acceptable.
- request more information, or time to review the proposal.
- take some another appropriate action based on the specifics of the proposal, as determined by the health officer.

Once the notification process is complete, no further action should be required from the health officer under normal circumstances. Registration, compliance, inspection and enforcement under the MWR will be conducted by MoE regional staff.

6.2.3 Format and Content

The health officer notification information must be sent via email. When sending information via email always request a reply message (or read receipt) to confirm that the message was successfully received and read by the health authority. Provide a copy of read receipts or emails to the MoE regional case as proof of notification.

The administrative and technical information below must be submitted by the proponent's QP. The information should be contained in one email.

Administrative information:

- Include the following subject - *Re: Request for Health Officer Approval in Support of a Reclaimed Water use Application under the Municipal Wastewater Regulation.*
- Provide the contact information for the MoE regional case manager (name and phone number) if known. If not, provide the name of the [applicable MoE regional office](#).
- If the MoE regional case manager is known, include them in the cc field, as an email recipient.
- Provide the MoE authorization reference number, if available.
- Provide the company name, mailing address and contact information for both the QP and proponent.

- Indicate the professional designation of the lead QP. A designation that is included as part of a signature block is acceptable.
- Provide the local contact information for the person providing reclaimed water, including address and phone number, if different than the proponent contact information provided above.

Technical information:

Where applicable, the information below may be provided on a plan of suitable scale.

- Provide the location and boundaries of the site(s) where reclaimed water will be used.
- Provide the name of the registered land owner(s) of the land where reclaimed water will be used.
- Indicate the city or nearest municipality where the reclaimed water will be used.
- Provide the street address (where available), and legal description of the site(s) where reclaimed water will be applied.
- Indicate the city or nearest municipality where the treatment facility will reside.
- Provide the full name and street address of the facility (where available) where the reclaimed water is produced.
- Provide the location of the point of distribution.
- Provide the reclaimed water use category and rationale for selection (see MWR Part 7).
- Summarize the proposed reclaimed water use and distribution system (treatment system, purpose of use, intended dates of usage during the year, hours of operation, potential for aerosol formation and transport, potential odour concerns, neighboring land use, domestic water intakes or supply wells within 500m or the usage area, disinfection details, alternate disposal or storage information, distribution details, and any additional requirements).
- Summarize the proposed effluent quality and receiving environment monitoring program.
- Provide comments on known public health risks associated with the proposed reuse (e.g. food handling, public access, etc...)
- Include any other information required by Part 7 of MWR.
- Provide any other information deemed relevant by the QP that may be useful in reviewing the proposal.

6.3 Health Officer Notification Exemption

Notification may not be required in the following circumstances:

- the reclaimed water use is authorised under a local service area bylaw, and the municipality, or a person under contract to the municipality, ensures compliance with the MWR and that proper operation and maintenance will occur.
- The reclaimed water use is authorised by an approved liquid waste management plan. Whether or not notification is required would be determined by the specific plan. Please contact the MoE regional office for further information.

Even in cases where notification is not required, it is still recommended that the proponent consult with the local health officer for potential input on a reclaimed water proposal. The MoE regional director may also consult with the health officer in these cases.

6.4 Changes to Existing Registrations

Changes to an existing MWR registration typically fall into one of two categories:

- Minor administrative changes
- Major changes that require a new registration

Some examples of common changes are highlighted below. If you are uncertain whether or not a change requires a new or updated registration, please contact the applicable MoE regional office or your case manager for more information.

6.4.1 Minor Administrative Changes

Minor administrative changes typically do not require a new registration. Some examples include:

- Minor administrative amendments such as a contact name or address change.
- A decrease (or an increase of no more than 10%) to the maximum registered discharge rate, where there is no change in impact to public health or the receiving environment compared to the original registration.

Minor administrative amendments typically do not require a new registration, however, notification of the change and any updated information must be provided to the MoE regional director within 30 days of the change taking effect.

6.4.2 Major Changes That Require a New Registration

Major changes require a new registration. Some examples include:

- An increase to the maximum registered discharge rate (>10%).
- A decrease (or an increase of no more than 10%) to the maximum registered discharge rate, where there is, or likely will be, a greater impact to public health or the receiving environment compared to the original registration. This may be due to a change in effluent quality or changes to the receiving environment.
- A change in the quality of reclaimed water resulting in a greater impact to public health or the receiving environment.
- A change in usage (i.e., an end user wanting to use reclaimed water for a purpose that was not authorised in the original registration. The authorised provider is responsible for updating the registration prior to the new use being permitted.
- A change in the area where reclaimed water is applied.
- Any other change that triggers an updated registration according to Section 16 MWR.

The information required for a new registration will be determined on a case by case basis by the MoE regional director. In most cases, a new 60 day notification will need to be sent to the health officer.

7. Categories of Reclaimed Water

The MWR includes four categories of reclaimed water. Each category has specific quality and monitoring requirements, as prescribed in the respective tables and sections of MWR.

The category is determined by a QP, and is based on the EIS, the design of the system, the intended use, and the likelihood of worker or public exposure.

The rationale for the category selected must be scientifically based, well established, documented in the EIS, and clearly conveyed to the MoE regional director and the health officer.

Examples of reclaimed water uses in each category are discussed below. These examples are not exhaustive, and the suggested reclaimed water use category may not be applicable in all cases.

7.1 Indirect Potable Reuse

The Indirect Potable Reuse category is the most stringent category of reclaimed water use, and requires prior approval by the MoE regional director. An enhanced EIS is required, with the terms of reference established in consultation with the regional director.

Uses may include replenishment of a potable water source or potential potable water source, and any other application, including food crops and urban reuse, where a very high level of quality is warranted.

Reclaimed water uses falling into this category require consultation with individuals and organisations that may be impacted by the reclaimed water use. This includes, but is not limited to, other ministries and agencies, local governments and local residents/landowners/businesses.

Note that fecal coliform limits (per 100ml) for this category shall be <1 CFU or <2.2 MPN with a maximum of 14 CFU in any one sample, based upon the previous 5 samples.

With this category, the discharger must demonstrate 60 days of compliance with fecal coliform limits prior to being permitted to conduct weekly testing.

When required due to the intended application, or if required by a health officer, a discharger is also required to monitor daily for Escherichia coli (E.coli) and maintain a limit of no more than 1 CFU/100ml or 2 MPN/100ml.

Quality and monitoring requirements for this category are provided in MWR Tables 13 and 14 respectively. See the MWR for additional requirements for this reuse category.

7.2 Greater Exposure Potential

The Greater Exposure Potential reuse category includes uses where public exposure or contact is likely and/or where the reuse could present a risk to the receiving environment and therefore warrants a high level of treatment.

Reclaimed water use in the greater exposure potential category may include: agricultural crops, golf courses, cemeteries, residential lawns, greenhouses, silviculture operations, urban reuse and landscaping around parks, playgrounds, schools. Irrigation for frost protection and crop cooling is also permitted.

A number of urban reuse activities may also be captured by this reuse category, including toilet and urinal flushing, and other decorative uses such as ponds and water attractions where public contact is likely.

With this category, the discharger must demonstrate 60 days of compliance with fecal coliform limits prior to being permitted to conduct weekly testing.

When required due to the intended application, or if required by a health officer, a discharger is also required to monitor daily for *Escherichia coli* (E.coli) and maintain a limit of no more than 1 CFU/100ml or 2 MPN/100ml.

Quality and monitoring requirements for this category are provided in MWR Tables 13 and 14 respectively. See the MWR for additional requirements for this reuse category.

7.3 Moderate Exposure Potential

The Moderate Exposure Potential category of reuse may be selected when public contact is unlikely, the users are well aware of the risks posed by the use, and there will be no detrimental impact to the receiving environment from the use.

Moderate Exposure Potential category reclaimed water may be applied to certain agricultural crops that are commercially processed or to vegetation such as pasture, nurseries, silviculture operations and some construction and industrial applications.

Landscapes may not be irrigated with this water. Orchards and vineyards irrigated with a drip irrigation system that does not contact the plant or crop may use this water. Spring frost protection is allowed but crop cooling and autumn frost protection are not.

Quality and monitoring requirements for this category are provided in MWR Tables 13 and 14 respectively. See the MWR for additional requirements for this reuse category.

7.4 Lower Exposure Potential

Lower Exposure Potential category reclaimed water is typically used in commercial or industrial applications where public access is restricted and where there will be no detrimental impact to the receiving environment from the use.

Users of reclaimed water in this category are well trained in the application and risks associated with the use, and procedures for safe use are well established and documented.

There are numerous commercial and industrial applications for reclaimed water. Some examples include: industrial process water, soil compaction, dust control, aggregate washing and concrete production.

Lower exposure category reclaimed water may also be used for vegetation such as pasture, fodder, nurseries, forested land that has limited public access, and silviculture operations in some cases. Worker contact with reclaimed water would need to be minimised, otherwise increased disinfection (or a higher use category) may be required.

Landscapes may not be irrigated with this water. Orchards and vineyards irrigated with a drip irrigation system that does not contact the plant or crop may use this water. Crop cooling and autumn frost protection are not permitted.

Quality and monitoring requirements for this category are provided in MWR Tables 13 and 14 respectively. See the MWR for additional requirements for this reuse category.

7.5 Quality Requirements

Reclaimed water quality is specified in Table 13 MWR and must be met at the point of distribution or use. If quality is measured at the point of distribution, precautions and controls must be in place to ensure the quality at the final point of use is maintained.

Quality requirements listed in Table 13 MWR are minimum requirements. An EIS or health officer may prescribe more stringent standards (or place limits on parameters not listed in the table) if required to protect public health or the receiving environment, or for operational reasons.

7.6 Disinfection

The intent of disinfection is to ensure that pathogen limits are reliably met and maintained at the point of use. The proponent must clearly demonstrate in their proposal how they intend to reliably meet applicable disinfection requirements based on the category and end use of the reclaimed water. Fecal coliform requirements are provided in Table 13 MWR.

When required due to the intended application, or if required by a health officer, a discharger is also required to monitor daily for *Escherichia coli* (E.coli) and maintain a limit of no more than 1 CFU/100ml or 2 MPN/100ml.

8. Alternate Disposal or Storage

When reclaimed water does not meet the required quality standards, or when reclaimed water production exceeds demand, the flow must be diverted to either an alternate method of disposal or an approved method of storage until such time that quality and demand are met.

When using an alternative method of disposal or storage, the provider of reclaimed water must manage the surplus to avoid adverse effects such as flooding, pooling or erosion.

8.1 Alternate Method of Disposal Requirements

An alternate method of disposal is required when reclaimed water is generated from residential or institutional sources or any other source where the generation of reclaimed water cannot be easily stopped. Some alternate methods of disposal are discussed below.

Disposal to Municipal Wastewater Collection System or Authorised Treatment Plant

A municipal wastewater collection system may be used to dispose of surplus reclaimed water and reclaimed water not meeting MWR quality requirements provided the discharger has received authorisation from the local government to do so, and the discharge is done in accordance with the requirements and bylaws established by the local government, or owner of the collection system.

Disposal of surplus reclaimed water at an authorised wastewater treatment plant by pump and haul may be considered, in rare and exceptional circumstances, provided approval is received by the regional director.

Surface Water Discharge (Outfall)

An outfall may be used to dispose of surplus reclaimed water, provided the discharge is in accordance with the MWR requirements for discharges to water, and is to the satisfaction of the MoE regional director.

Where surface water is proposed as an alternate method of disposal, the EIS will need to establish a suitable sampling and monitoring program and consider downstream domestic uses.

Sub-surface disposal

A sub surface disposal system may be used to dispose of surplus reclaimed water, provided the discharge is in accordance with the MWR requirements for discharges to ground, and is to the satisfaction of the MoE regional director.

Sub surface disposal requires a hydrogeological assessment as part of the EIS. The hydrogeological assessment is to be conducted by a qualified professional and must address soil stability, erosion, and environmental impact on-site and off-site resulting from the subsurface disposal activity. The assessment must also consider the vulnerability of nearby aquifers.

The report must include recommendations on the number and locations of groundwater sampling wells, and at least one of those wells must be a background sampling well.

Infiltration Basins

Infiltration basins may be used to dispose of surplus reclaimed water provided the discharge is in accordance with the MWR requirements for discharges to ground, and is to the satisfaction of the MoE regional director.

The use of multiple basins is encouraged, provided that there is a low enough frequency of dosing, so that a dose can infiltrate into the ground before the next dose is applied.

Infiltration basins require a hydrogeological assessment as part of the EIS. The hydrogeological assessment is to be conducted by a qualified professional and must address soil stability, erosion, and environmental impact on-site and off-site resulting from the subsurface disposal activity. The assessment must also consider the vulnerability of nearby aquifers.

The report must include recommendations on the number and locations of groundwater sampling wells, and at least one of those wells must be a background sampling well.

The qualified professional must also develop an infiltration basin maintenance program.

Evaporation Basins

Evaporation is generally discouraged as a primary method to dispose of surplus reclaimed water. When a qualified professional can demonstrate that there is a propensity for greater evaporation losses than precipitation, evaporation basins may be considered for back-up contingency use only.

Reclaimed water flows in excess of evaporation losses may be discharged elsewhere, if a qualified professional can demonstrate to the MoE regional director that the reclaimed water has been sufficiently treated for the discharge method and location proposed. This option would also require a suitable environmental sampling and monitoring program.

Good engineering must be used to maximize exposure to solar radiation while protecting the embankments from wave erosion.

Deep Well or Sub-surface injection

Deep well injection is generally discouraged as a primary method to dispose of surplus reclaimed water. When a QP can demonstrate that there is no viable alternative, deep well injection may be considered for back-up contingency use only.

Written authorisation to proceed must be obtained by the MoE regional director, and construction must not begin until authorisation is received. Sub-surface injection proposals will be reviewed by the MoE regional director in consultation with the local health officer.

The discharger must provide an environmental assessment, conducted by suitably qualified professionals, which includes recommendations for an environmental sampling and monitoring

program. A series of sampling wells to demonstrate the efficacy of the deep well injection program should be included in the sampling and monitoring program.

8.1.1 Exemption from Alternate Method of Disposal Requirement

An alternate method of disposal is required in all cases, except as follows:

Dedicated storage

Storage alone may be used in lieu of an alternate disposal method, provided the conditions in the MWR are met and approval has been received from the MoE regional director.

In most cases only reclaimed water from non-residential or non-institutional sources would qualify for this exemption (i.e. sources that allow the generation of reclaimed water to be easily stopped).

To qualify for this exemption, the dedicated storage must conform to one of the following two scenarios:

1. Dedicated storage must be available that can accommodate:
 - 48 hours of emergency storage, and
 - the ability to stop generating municipal wastewater within 24 hours.

2. Dedicated storage must be available that can accommodate:
 - 20 days of design average daily effluent flow at anytime, and
 - the maximum anticipated volume of surplus reclaimed water, and
 - storm or snowmelt events with less than a five-year return period

Wetlands

If reclaimed water is discharged directly into a natural or constructed wetland, the director may waive the requirement for alternate disposal if there is sufficient reliability and no alternate method is deemed required to ensure protection of public health or the environment.

To qualify for this exemption, the EIS must demonstrate that the reclaimed water will not negatively impact or alter the ecosystem of the natural wetland.

In the case of constructed wetlands, the design of the wetland must be satisfactory for the intended purpose, and the wetland must not negatively impact nearby ground or surface waters.

Constructed wetlands require the design of earthworks to contain the wetland area, and prevent water exchange with groundwater through the use of an impermeable liner. A constructed wetland must also feature an engineered outflow. QPs are expected to follow commonly accepted standards and practices when designing constructed wetlands.

Scientific rationale must be submitted to the satisfaction of the regional director before the alternate method of disposal requirement will be waived.

8.2 Emergency Storage Requirements

Emergency storage is required when there is an alternate disposal method but that method cannot be relied upon to immediately accept surplus reclaimed water in the event of an emergency. In that case, a minimum of 48 hours of storage must be provided.

When emergency storage is used, the provider must ensure that flow can be diverted back to the alternate disposal method prior to the storage capacity being exceeded; otherwise the provider must stop generating reclaimed water.

Reclaimed water stored as part of regular operations must not conflict with emergency storage requirements. E.g., if a storage reservoir has an allotted emergency storage allowance, that allowance must not be used as part of regular operations.

8.2.1 Exemption from Emergency Storage Requirement

Emergency storage is not required if there is an alternate method of disposal that can be relied upon to immediately accept surplus reclaimed water in the event of an emergency. This determination must be made by a QP.

An example of an alternate disposal system that would qualify for this exemption is a connection to a municipal wastewater collection system where it can be demonstrated that the control and conveyance equipment can be reasonably relied upon to immediately begin diversion of surplus reclaimed water to the municipal system during an emergency.

Other methods may also qualify for this exemption as determined by a QP.

8.3 Additional Storage Considerations for Irrigation Works

When reclaimed water is used for irrigation or other purposes it is crucial that an alternate (or contingency) system be available for reclaimed water that is surplus to the needs of the irrigation system or regular use. It is expected that reclaimed water will be generated year round but the irrigation system can only apply the water during the summer period when there is a climatic moisture deficit. The fill rate and water level information for the main reclaimed water storage reservoir might be used to establish a date to start use of the contingency facilities to prevent failure of the storage system. In addition, if the water comes directly from the treatment facility, then there must be contingency facilities capable of handling reclaimed water that temporarily may not meet the required standards and requirements for its use.

Wet Climates

The storage facility may have to provide an allowance for cumulative volumes of reclaimed water because of reduced irrigation in wet weather. If the average seasonal irrigation requirements are used to determine the irrigation area, then this may not be necessary. If the land base area is not sufficient to accommodate the average seasonal irrigation requirement, then a cumulative capacity of five years of wet weather for a five-year return period should be added to storage.

Frost Protection

While frost protection is an acceptable use and can allow reclaimed water use earlier in the spring or later in the autumn than normal irrigation, frosts cannot be predicted and cannot be relied upon for reclaimed water use every year. An estimate of reclaimed water use for frost protection can be made and added to the storage volume calculation for the purposes of ensuring adequate supply. The *BC Frost Protection Guide*, available from the Ministry of Agriculture provides further information.

Crop Cooling

Crop cooling does not add enough moisture to the soil to mitigate the climatic moisture deficit. Therefore, crop cooling requires water additional to the irrigation supply. Crop cooling needs should be estimated and included in the design of the storage facility to ensure adequate supply. The Ministry of Agriculture fact sheet *Irrigation for Tree Fruit Cooling* (1995) provides additional information.

Supplementary Water

Freshwater irrigation supplies often have a water shortage later in the irrigation season when stream and groundwater sources decline. Reclaimed water can augment these supplies in some regions. An estimate of the amount of reclaimed water needed must be calculated and added to the storage volume. While this supplemental irrigation water may not be required each year, it must be accounted for if it is part of a water supply plan.

Multiple storage reservoirs

Using multiple storage reservoirs is encouraged.

Improved Water Quality

Storage of reclaimed water can be used to improve water quality through bacteriological decay when sufficient storage time is available.

Inlet/Outlet Arrangements

The flow to and from storage needs to be designed to minimize short-circuiting.

Maintenance of Quality

The discharge must consider artificial aeration in deep storage basins to minimize stratification and odours and to prevent oxygen depletion.

9. General Design and Construction Requirements

The generation and use of reclaimed water requires that all treatment and conveyance systems be reliable and robust and include contingency for alternate storage and disposal.

QPs must ensure that appropriate levels of reliability are built into the design of all system components. Reclaimed water systems may fall into reliability category 1, 2 or 3 as detailed in Sections 34-37 MWR.

The reliability category is determined by a QP in accordance with the EIS. The necessary level of reliability must then be factored into the design of the system.

General Design and Construction Principles:

- All reclaimed water valves, outlets, quick couplers and sprinkler heads must be of a type or secured in a manner that only permits operation by personnel authorized by the user.
- All piping must be of a distinct colour to differentiate reclaimed water from domestic water. Purple is typically used for this purpose, where available.
- All piping, valves, outlets and controllers must be marked with proper labelling to identify that reclaimed water is used.
- Signage and labelling should follow the recommendations provide in the Signage, Labelling and Fencing section of this guideline.
- Use or installation of hose-bibbs on any irrigation system presently operating, or designed to operate with reclaimed water, regardless of the hose-bibb construction or identification, is not permitted unless it can be demonstrated to a regional director that special circumstances justify their use.
- Impoundments must be designed, operated and maintained to minimize fluid leakage. Any leakage must not aggravate or produce soil or bedrock instability or erosion elsewhere or impact ground or surface water quality.
- Temperature of water in impoundments should be kept at below 20° Celsius.
- The perimeter of the disposal area must be graded to prevent ponding along public roads or other public areas.
- Precautions must be taken to ensure that reclaimed water will not have contact with any facility or area not designated for use, such as passing vehicles, buildings, domestic water facilities or food handling facilities.
- Drinking water facilities must be protected from direct or windblown reclaimed water spray.
- Food facilities (where food is handled or consumed) must be protected from direct or windblown reclaimed water spray.
- Adequate measures must be taken to prevent the breeding of insects and other vectors of health significance, and the creation of odors, slimes or unsightly deposits.
- Direct public contact with reclaimed water must be minimized.

Designers of irrigation systems should also refer to the *Guide to Irrigation System Design with Reclaimed Water*, a factsheet prepared by the Ministry of Agriculture.

10. Guidance for Specific Activities

10.1 Irrigation

Irrigation is the artificial application of water to the soil or a growing medium to sustain plant growth and/or optimize crop production. Irrigation systems applying reclaimed water can be used for silviculture, landscape systems, and a variety of agricultural operations including greenhouses.

Irrigation systems can be used to apply reclaimed water to crops or landscaping in places with a moisture deficit during the growing season, for frost protection in the spring and autumn, and for crop cooling during hot times in summer.

10.1.1 General Requirements

- Irrigation systems should be designed following standards outlined in the BC Sprinkler Irrigation Manual and the BC Trickle Irrigation Manual.
- Irrigation shall be applied to provide crop water needs over an irrigation interval, providing an allowance for some leaching, but minimizing leaching to groundwater.
- Reclaimed water contains higher levels of metals than most fresh water supplies. Water samples should be taken to ensure that metals and specific ions do not exceed BC or Canadian Water Quality Guidelines.
- Reclaimed water may not be used for irrigation within 30m of any well or in-ground reservoir used for domestic supply, unless it can be demonstrated to the regional director that special circumstances justify lesser distances to be acceptable. A QP may also recommend a greater distance where appropriate.
- There must be no surface runoff of reclaimed water from irrigated lands.
- Reclaimed water irrigation systems must be managed to avoid aerosol drift to areas where food is handled or consumed.
- Adequate disinfection (minimum chlorine residual of 0.5 mg/l) must be maintained in reclaimed water discharged from the disinfection system to the irrigation system i.e., minimum residual chlorine must be present at the point of use.
- Irrigation with reclaimed water must not occur within 60m of areas where food is handled or consumed.
- When using reclaimed water on parks, playgrounds and school grounds, the reclaimed water provider must ensure that no direct contact between the reclaimed water and any person occurs while irrigation is underway.
- An irrigation system must have a winterization port at its connection to the reclaimed water distribution system, allowing an air compressor to drain the irrigation lines prior to winter. A shutoff valve must also be provided for winterizing the system.
- Irrigation must be controlled to prevent ponding and run-off of reclaimed water.
- Provide adequate signage and notification so the public is aware that reclaimed water is being used.

Designers of irrigation systems should also refer to the *Guide to Irrigation System Design with Reclaimed Water*, a factsheet prepared by the Ministry of Agriculture. Certified Irrigation Designers for agricultural and landscape systems can be found at www.irrigationbc.com.

10.1.2 Assessment of New Areas to be Irrigated

An assessment of any area to be irrigated must be performed by a suitably qualified QP (agrologist or pedologist), using best current climate and soils data to substantiate that the land is capable of accepting reclaimed water for irrigation. This assessment must include any suggested restrictions or recommendations that the qualified professional deems necessary, including any further assessments.

This soils assessment must be submitted to the regional director for review, prior to the initial commencement of irrigation on the site in question. Further review and ongoing soils assessments are to be conducted in accordance with the qualified professional's recommendations or as may be required by the regional director. Information required annually should appear in the annual report.

The health officer must be consulted when assessing new irrigation areas.

10.1.3 Assessment of New Uses for Reclaimed Water

An assessment of any new use of reclaimed water must be performed by a suitably qualified professional who can substantiate that the reclaimed water is suitable for the proposed use. This assessment must include any suggested restrictions or recommendations that the qualified professional deems necessary, including any further assessments.

This assessment must be submitted to the director for review prior to the initial commencement of the new use. Further review and ongoing assessments are to be conducted in accordance with the qualified professional's recommendations and as may be required by the regional director.

The health officer must be consulted when assessing new uses of reclaimed water.

10.1.4 Agricultural and Commercial Irrigation

Agricultural irrigation may use a variety of irrigation system types, including sprinklers, center pivots, travelling guns, drip or trickle, and subsurface drip. Stationary guns are not approved as their application rate exceeds the storage capacity of most soils in a short period of time.

Reclaimed water can have a beneficial nutrient content. Knowledge of nutrient uptake and removal by the crop is required to adjust fertilization programs to account for the nutrients supplied by the reclaimed water.

Greater exposure category reclaimed water may be applied by sprinkler irrigation systems, pivots and travelling guns to forage, fibre, nursery, or turf crops, and to crops that will be eaten raw, provided that the water does not contact the fruit or vegetable directly (i.e., drip or trickle irrigation is used) and *E. coli* is monitored in addition to fecal coliforms. Where crops are eaten raw, crop irrigation should be avoided in the short period before harvest.

Drip and trickle systems must be used for sweet corn, berry, and fruit crops. Vegetable crops must be irrigated with a subsurface drip irrigation system. Root crops may not be irrigated with reclaimed water if they are likely to be eaten raw. Commercially processed vegetables should be thoroughly washed and cooked following industry accepted procedures for reclaimed water applications.

Extra precautions should be taken with sweet corn and some cole crops. Water that accumulates inside the husks may not have an opportunity to drain away and may be shielded from the disinfecting effects of sunlight. There is greater potential for bacteria to grow under these conditions.

Moderate exposure potential category reclaimed water may be applied by sprinkler irrigation, center pivots and travelling gun systems only to forage, fibre, nursery and turf, or food crops that are commercially processed.

10.1.5 Sprinkler Irrigation

Sprinkler systems use a spray pattern to distribute water to the crop. Sprinkler irrigation systems that can apply reclaimed water to agricultural crops include center pivot, handline, wheelmove, solid set overtree and undertree, microsprinklers, and travelling and stationary guns. The type of system selected depends on the crop to be grown, field shape, topography, and system management.

The irrigation system must be designed following the standards in the BC Sprinkler Manual and operated so that the application rate matches the crop water requirement throughout the growing season. An allowance for some leaching must also be incorporated to ensure that salt build-up in the soil does not occur. Correct selection of sprinkler spacing, nozzles, and operating pressure is necessary.

10.1.6 Drip/Trickle Irrigation

Drip/trickle irrigation systems use emitters to apply water directly to the plant rooting area. Water is applied at a low flow rate but in an amount sufficient to replenish the crop water requirements frequently, usually daily. Spray emitters that apply water only to the plant rooting area can be considered a trickle system. Drip/Trickle systems must be designed following the standards in the BC Trickle Irrigation Manual, prepared by the Ministry of Agriculture.

10.1.7 Subsurface Drip Irrigation (SDI)

These drip systems are buried below the soil surface. This method of installation increases the volume of soil wetted by an emitter, improves crop yield and quality, reduces disease transfer, and reduces weed growth. The design, maintenance, and installation of SDI systems are different from surface systems. For more information see the BC Trickle Irrigation Manual, prepared by the Ministry of Agriculture.

10.1.8 Subsurface irrigation

Subsurface irrigation is usually applied through a tile drainage system located 900 to 1200 mm below the surface level, and uses capillary forces to bring water to the plant roots. A tile drainage system must

be specially designed to function as a subsurface irrigation system. These types of systems are usually only viable for deeper rooted crops.

Subsurface irrigation is part of reuse and must be designed by a qualified professional.

10.1.9 Frost Protection

Irrigation systems can be used for frost protection in spring and autumn. Under-tree irrigation systems protect crops by raising the air temperature slightly above the freezing level. Over-tree irrigation systems offer more protection by encasing plant buds in ice, thereby preventing the bud temperature from dropping below the freezing level. See the BC Frost Protection Guide.

Spring frost protection may use the greater or moderate exposure categories of reclaimed water, since the reclaimed water is used well before the crop is harvested. Autumn frost protection may be used on crops that are processed but not for crops that are eaten raw, since the application will generally be close to harvest. Only the greater exposure category of reclaimed water may be used in the autumn, since the application is often close to harvest.

For overhead irrigation systems used for frost protection, the system must be turned off as soon as water runs freely between the ice that has formed and the plant material.

10.1.10 Crop Cooling

Irrigation systems can provide evaporative cooling to reduce plant or fruit temperature during the hottest part of the day. The application rates used for crop cooling systems are less than for irrigation. The systems are generally operated on a cycle of 1/3 on and 2/3 off. See Ministry of Agriculture factsheet 578.300-1.

Only the Greater Exposure Potential category of reclaimed water (or better) may be used for crop cooling. Reclaimed water may only be used for crop cooling until 30 days before harvest of crops that are eaten raw.

10.1.11 Silviculture

Forest-seed, seedling, and seed-orchard production operations use overhead and drip irrigation systems for many types of production practices.

The moderate exposure category of reclaimed water may be used if the silviculture operation is outdoors. Indoor use of this type of reclaimed water requires a drip irrigation system.

Spray or mist systems used indoors should use the Greater Exposure Potential category of reclaimed water as there is a risk the reclaimed water could become aerosolised.

Reclaimed water can also be applied to stands of trees in a forest by solid set sprinkler systems. Reclaimed water applied to forested area must not cause a negative change to the ecological structure and species composition in the area where application occurs.

10.1.12 Greenhouses

Greenhouse irrigation systems include spray and mist systems for propagation areas, drip systems for food crops and some potted plant production, and flood or ebb-and-flow systems for floriculture and nurseries.

Similarly the greater exposure category of reclaimed water must be used for mist and spray systems in greenhouses. The moderate exposure category may be adequate for flood and drip systems.

10.1.13 Landscape Irrigation

Landscape systems are often automated and can be categorized into three types of systems: sprinklers or rotors, spray heads, and drip.

Sprinkler Systems

In-ground rotors are usually used for larger landscape turf systems such as larger yards, playgrounds and sports fields. The size of the rotor depends on the size of the area to be irrigated type of turf (sports field, golf course, or landscape lawn), water supply, and pressure availability.

Spray Heads

Spray head systems are available in many patterns and can spray water up to 6 m. Spray heads are often used in small, narrow turf and landscape areas. They have a very high application rate and should therefore be operated for short durations (15 minutes or less) to prevent runoff.

Drip Systems

Point-source and spray-emitter drip/trickle systems are often used in landscape situations. For more information see the BC Trickle Irrigation Manual, prepared by the BC Ministry of Agriculture.

Generally, landscape irrigation where there is a high likelihood of public contact may only use the Greater Exposure Potential (or better) category of reclaimed water.

The Moderate Exposure Potential category may be considered where there is a minimal likelihood of public contact or where there is restricted public access and user education is provided.

In order to use Moderate Exposure Potential category reclaimed water for landscape drip systems, the following requirements need to be observed:

- a minimum amount of required storage is provided
- the discharger demonstrates to the satisfaction of the MoE Regional Director that access is controlled
- environmental concerns are addressed
- any concerns of the local health authorities are resolved

- the MoE Regional Director, in consultation with local health authorities, approves the use in writing

10.1.14 Grazing Animals

Milking animals must be prohibited from grazing for 6 days after irrigation ceases. Other livestock must be prohibited from grazing for 3 days after irrigation ceases, unless their meat is inspected under the *Meat Inspection Act (Canada)*.

10.1.15 Cross Connection Control

There must be no connection between a potable water supply and reclaimed water. Potable and non potable water must be separated by an air gap or reduced pressure principle device.

An approved backflow preventer must be used where a cross-connection might cause contamination of a potable water system.

10.1.16 Soil Considerations

Irrigated land must be monitored to prevent soil saturation, surface erosion, and instability in the irrigated areas and down gradient of the irrigated lands.

While all water sources contain some salts, reclaimed water contains higher levels of salts than the fresh water supply. There is also a higher proportion of sodium in relation to other dissolved cations.

The primary concerns for sodicity and salinity control in reclaimed water are:

- selecting crops properly
- ensuring adequate salt and specific ion tolerance of the crops to be irrigated
- ensuring satisfactory levels of salinity, sodicity, and specific ion concentrations in soil seed-bed during germination
- ensuring sufficient irrigation to allow for some leaching
- ensuring sufficient drainage to dispose of leaching water

10.1.17 Design Suggestions

Irrigation systems should be designed by qualified professional engineers, or by certified irrigation designers as listed on the website www.irrigationbc.com.

Drawings for modifications (including extensions to existing works) must be signed and sealed by a qualified professional. Retain a copy of all as-built drawings in case they are requested by the MoE regional director.

Irrigation works must be designed and constructed in accordance with best current practices. For agricultural irrigation systems, the design must also be in accordance with the most current versions of

the BC Sprinkler Irrigation Manual or BC Trickle Irrigation Manual, as applicable, published by the Ministry of Agriculture.

Turf and landscape irrigation systems must be designed in accordance with standards established by the Irrigation Industry Association of British Columbia.

10.1.18 References

These publications and fact sheets are available from the Ministry of Agriculture.

- The BC Sprinkler Irrigation Manual
- The BC Trickle Irrigation Manual
- Irrigation Management Guide
- Chemigation Guidelines for British Columbia
- Irrigation System Cross Connection Control
- BC Frost Protection Guide
- Using Irrigation for Tree Fruit Cooling
- Guide to Irrigation System Design with Reclaimed Water
- Irrigation Scheduling Techniques
- Irrigation Scheduling with Tensiometers
- Evapotranspiration Rates for Turf Grass in BC
- Determining the Irrigation Requirements for Turf and an Irrigation Schedule

10.2 Urban Reuse

Dual distribution involves the provision of two grades of water to the same service area – one potable and the other non-potable. The potable source is intended for human consumption while the non-potable source – highly treated wastewater – is acceptable for a wide range of other uses. The uses are determined by the process used, the reclaimed water quality, and the monitoring program.

The use of dual distribution systems is becoming common in many areas with water restrictions and shortages, and in other areas to promote sustainability of existing water resources.

Developing a dual distribution system might be less costly and less wasteful than existing practices that use potable water for purposes that do not require potable water quality.

Properly treated and distributed non-potable water can be used for lawn and landscape irrigation and other non-potable urban water uses, provided that specific measures developed in consultation with the MoE regional director and the local health officer are in place.

Design and Installation Requirements

Dual-distribution systems within buildings must conform to the provisions of the BC Building Code and any applicable municipal requirements.

Providers are also responsible for ensuring that delivery pipes and equipment used to supply reclaimed water are properly identified and marked. Please see the Signage, Labelling and Fencing section of this guideline for further information.

Plans for dual-distribution systems in buildings and irrigation systems must pass local inspections conducted by local building inspectors before they are approved.

Providers must also ensure that adequate cross-connection control measures are in place. Providers must ensure that an approved backflow prevention device is installed at the potable water connection to reduce the risk of unintended cross-connections.

Construction of dual-distribution mains is subject to approval by the local health officer and must be installed in a manner that is consistent with Ministry of Health policy regarding water main and sewer separation distances. A reclaimed water line can be installed in the same trench as a sanitary sewer line providing that the reclaimed line is installed above the sanitary sewer line.

There must be at least a 3.0m horizontal and a 450mm vertical separation between all pipelines transporting reclaimed water and those transporting domestic water. Domestic water lines must be located above reclaimed water lines.

Irrigation System Design and Installation:

Irrigation systems applying reclaimed water in domestic areas must be designed in accordance with standards established by the Irrigation Industry Association of BC. Prior to installation, the property owner must submit irrigation system design plans to the municipality and/or reclaimed water provider. Plans must be designed by a Professional Engineer, or a Certified Irrigation Designer with the appropriate designation for the work to be done.

The irrigation system must be installed by a contractor that has a Certified Irrigation Technician Level 2 (CIT – 2) on staff registered with the IIABC. The contractor is responsible for:

- ensuring that the irrigation system is installed according to the design plan
- providing an irrigation schedule to the owner that provides guidance on how to operate the system and how the schedule changes through the irrigation season
- providing an as-built plan that accurately shows the locations of pipes, sprinklers, valves, and other equipment.

Sprinkler spray heads, and drip/trickle irrigation systems can be used to apply reclaimed water to landscape areas on private lots, but caution should be exercised to avoid public contact with aerosols. Sprinkler and spray equipment must be permanent in-ground systems with pop-up heads. Drip emitters may be installed either above or below ground.

For garden areas, drip irrigation systems must be used for sweet corn, berry, and fruit crops to prevent reclaimed water from contacting the edible portion of the crop. Vegetable crops must be irrigated with a subsurface drip irrigation system. Root crops cannot be irrigated with reclaimed water if they are likely

to be eaten raw. Irrigation should be avoided in the short period before harvest and processed vegetables should be thoroughly washed and cooked.

Irrigation equipment must be operated to prevent spray drift onto adjacent properties and the irrigation system application rate must not exceed the infiltration rate of the soil or cause any surface runoff.

An automated irrigation system must be used where irrigation is used to apply reclaimed water to urban landscape or turf areas not supervised by a landscape professional. The irrigation controller must have a minimum of two start times per day, seven days per week. The “on” time for each station must be able to be set in one-minute increments.

Cross Connection Control:

To protect the quality of potable water supplies, proper cross connection control must be in place.

A person operating and maintaining a reclaimed water distribution system, must be certified in cross connection control inspections for controlling and protecting potable water systems against contamination from unprotected cross connections.

Users must not under any circumstances connect the reclaimed water supply to the potable water supply.

Where reclaimed water is provided, the user must install an approved backflow prevention device on the potable water supply line. The backflow preventer device must be approved by the water provider and installed close to the point of connection to the provider’s distribution line in an easily accessible location. The device must be inspected annually by a certified tester, and a certificate of inspection shall be made available to the provider upon request.

Shutoff Requirements

The reclaimed water line to a residential or commercial lot must have a manual shutoff valve that is easily identifiable and accessible to the property owner. The valve must be installed prior to the distribution system of reclaimed water to the property.

Hours of Operation

Irrigation systems using reclaimed water in residential or public areas should be scheduled to only operate between 10:00 PM and 6:00 AM.

10.3 Toilet and Urinal Flushing

Reclaimed water may be used in residential and commercial buildings where permitted by applicable building codes and health legislation. The use of reclaimed water within single family dwellings may be permitted with specific measures in place, developed in consultation with the MoE regional director and local health officer.

A dedicated piping system must be available when reclaimed water is supplied. Internal building plumbing for reclaimed water must meet the requirements of the BC Building Code and any applicable municipal requirements.

General Requirements

All reclaimed water piping inside buildings must be properly labeled and colour-coded, including plumbing to toilets and urinals. Purple is commonly used to identify reclaimed water piping. Please refer to the BC Building Code for all plumbing requirements.

The capability to chlorinate reclaimed water should be available and a residual level of chlorine should be maintained. In case where potable water is also supplied to the property, a backup connection to the potable water system is also recommended.

Where commercial applications are practiced, adequate signage must be provided to inform the public that reclaimed water is used. Signage should be easily visible and located near water fixtures.

Toilet and urinal flushing should use greater exposure potential category of reclaimed water quality. Reclaimed water used in toilets must be clear, odourless and sufficiently disinfected. Sufficient residual chlorine must be provided for continuous disinfection. The Health Canada Guidelines referenced below should be followed.

Toilet and urinal flushing uses can only be approved with installed and tested backflow prevention devices. Please refer to BC Building Code for other requirements.

Users must under no circumstances connect the reclaimed water supply to the potable water supply.

References

- Canadian Guidelines for Domestic Reclaimed Water for Use in Toilet and Urinal Flushing, Health Canada
- Metcalf & Eddy an AECOM Company, Inc. *Water Reuse: Issues, Technologies and Applications*. USA: 2007.

10.4 Ponds and Decorative Uses

Reclaimed water may be used for ponds and other outdoor decorative uses. A Greater Exposure Potential category reclaimed water is typically required for this use.

General Requirements

Reclaimed water may be used in landscape water features such as artificial ponds and streams, fountains, and sheet water attractions if the water is recirculated.

Because of the potential for coliform regrowth, continued disinfection is recommended. Disinfection also inhibits the growth of unsightly algae, which can occur because reclaimed water generally carries higher levels of nutrients than fresh water.

Design Suggestions

Ponds should be built in such a way to prevent direct contact with or even wading into the water, and measures should be provided to protect against aerosols that would be generated. The temperature of water in ponds should be kept at below 20° Celsius.

When landscape features are drained, the water must not be discharged to storm sewers or any surface water body, except with prior written consent from the MoE regional director. The water may be discharged to an infiltration basin, a sanitary sewer, or a subsurface disposal system such as a dedicated tile field.

The inclusion of an automatic disinfection system, or inclusion of instructions on periodic shocking of the system with a disinfectant (e.g. chlorine granules), is recommended to enhance end-user satisfaction with water features.

10.5 Stream Augmentation

In some circumstances it may be environmentally beneficial to augment the natural flow of water in a stream with reclaimed water. This practice is separate and distinct from the discharge of effluent (i.e., non-reclaimed water) to water bodies. For the definition of “stream” and “stream channel”, refer to the *BC Water Act*.

General Requirements

For the purposes of this guideline, stream augmentation occurs when reclaimed water is added to a stream to augment the natural flow of water in the stream. There must be a demonstrated need, or net benefit to the receiving environment when considering an augmentation proposal (i.e., one may not simply discharge excess reclaimed water and call it “augmentation”).

In cases where natural or remaining natural stream flow is insufficient to support the normal full spectrum of healthy aquatic life, reclaimed water may be used to supplement the water flow in a stream. The reclaimed water could be added during a low-flow period, such as the summer months, or it could be added year-round.

The Indirect Potable Reuse category of reclaimed water must be used for stream flow augmentation. Additional water quality requirements will be determined by an advanced environmental impact study with the terms of reference developed in consultation with the MoE regional director. The final discharge requirements may therefore be more stringent than what is defined in MWR.

A stream flow augmentation plan must be prepared to provide guidance regarding the method of stream flow augmentation. The plan should also recommend any mitigating measures, such as pre-aeration or the use of a surface holding pond to moderate water temperature.

The reclaimed water must be non-toxic to aquatic life and must not adversely affect downstream uses or users, including domestic uses. The discharge must also not cause established Water Quality Objectives/Guidelines to be exceeded in the receiving environment.

It is probable that a high level of treatment will be required for stream flow augmentation. Provisions for phosphorus and nitrogen reductions are also highly likely. The environmental impact study would need to consider the impact of nutrients on stream water quality and on any waterbodies downstream and also the location of downstream users and impacts to domestic water supplies.

A proposal for augmentation should consider parameters such as: residual chlorine, total dissolved solids, dissolved oxygen, organic matter, nutrients and temperature, toxicity, and any other parameter that may be of concern.

Stream augmentation projects need to be examined individually and must stand on their own merit. It is critical that stream augmentation projects complement the naturally present ecosystem and do not negatively alter the ecosystem structure or species composition of the receiving environment.

Design Suggestions

The design and assessment must be conducted on a case by case basis by suitably qualified professionals with experience in advanced wastewater treatment and stream augmentation projects.

10.6 Habitat Development and Enhancement

In some circumstances it may be environmentally beneficial to enhance or create natural habitat. This would typically include the development or enhancement of wetland areas (natural or constructed).

Reclaimed water applied for this purpose must not negatively alter the natural ecosystem or species structure of the habitat.

General Requirements

Indirect potable reuse and greater exposure potential categories may be used to supplement natural water in a program of habitat restoration or enhancement, depending on site specific factors.

Reclaimed water might contain nutrients that could have a negative effect on downstream water quality. The temperature of the reclaimed water might also affect aquatic life in the stream. Therefore the provider of reclaimed water should ensure that the temperature of the reclaimed water does not adversely affect the ecosystem and nutrients are removed as necessary to limit algae growth in impoundments. Also, improper addition of water to the stream could result in erosion of the stream bed or stream bank.

Reclaimed water added to natural wetlands as part of habitat enhancement or restoration must not negatively alter the natural ecosystem of the wetland. Habitat restoration/enhancement projects will be examined individually and must stand on their own merit.

Design Suggestions

An assessment conducted by suitably qualified professionals is required to ensure that the quality of the reclaimed water is acceptable for the intended use, and that there are no contaminants present, such as nutrients, that could adversely affect downstream water quality.

10.7 Commercial Vehicle, Driveway and Street Washing

Reclaimed water may be used for washing streets, commercial driveways and commercial vehicles.

General Requirements

The category of reclaimed water suitable for washing streets, commercial driveways and commercial vehicles must be determined based on the likelihood of public exposure, and impact and likelihood of potential runoff. Equipment used for this purpose must not be used for distribution of potable water, and must be permanently marked as “non-potable” use.

A Moderate or Greater Exposure Potential category of reclaimed water may be used for street washing. If there is a high likelihood of public exposure, or impact due to runoff, then the higher category of reclaimed water may be needed.

Tanker trucks containing reclaimed water must be adequately marked to show that reclaimed water is being used. Street cleaning should be coordinated to avoid times of when there is greater public presence.

If a chlorine residual greater than 1.0 mg/L is in the reclaimed water in street-cleaning tankers, then de-chlorination must be provided to protect fish and fish habitat. Public information and advisories should be made available to advise the public that reclaimed water will be used in the street-washing program.

Commercial car washes must use special hose-bibbs and hoses that use quick-disconnect fittings. Hoses used for reclaimed water must not be used for potable water uses. Hoses must have a shut off nozzle so that the supply is shut off when not being used. Hose bibbs and piping must be colour-coded and marked to identify the source of water. Purple is commonly used to identify reclaimed water piping. Please refer to the Signage, Labelling and Fencing section of this manual and the BC Building Code for additional requirements.

10.8 Snow and Ice Making

Reclaimed water may be used in place of fresh water in snowmaking machines to supplement natural snowfall prior to or early in the recreational season. The intent would be to provide a base to help a recreational operation open for the season.

Reclaimed water may also be used for making and re-surfacing recreational ice surfaces (e.g. skating and curling rinks).

General Requirements

Only the greater exposure potential category of reclaimed water may be used for snowmaking for skiing or snowboarding. The moderate or lower exposure potential category of reclaimed water may be used for snowmaking not intended for skiing.

Records of the amount of reclaimed water used in snowmaking and the location where it is used must be maintained. This information should appear in an annual report.

Snowmaking equipment must be adequately marked to show that reclaimed water is being used, and ski passes where reclaimed water is used in snowmaking must state that reclaimed water is used.

Staff working at ski hills using reclaimed water must be made aware of the source of water used in snowmaking equipment.

When snow making is within a drinking water watershed, there should be no adverse impact on raw water quality.

Care must be taken with the disposal and storage of the waste ice surfacing material from recreational facilities and public access to the snow pile should be avoided.

In general, public access and exposure to equipment and any health hazards must be avoided.

Design Suggestions

The freeze-thaw cycle tends to pass any contaminants in the snow down to the underlying soil. Contaminants in the snow travel vertically through the snow base to the ground underneath where renovation occurs during the freeze-thaw cycle. However, a rapid snowmelt could result in overland flow of meltwater. Therefore, it is prudent to ensure that snow from reclaimed water is applied prior to or early in the ski season.

The runoff expected due to snowmelt from reclaimed water sources must be considered in the environmental impact study when determining specific quality or management requirements. Reclaimed water used to make snow must not create or add to a nutrient problem in area streams or lakes as it melts.

A snowmaking operations plan prepared by a suitably qualified professional is required prior to snowmaking. This plan will identify the precise areas that would benefit from snowmaking and outline the procedures to be followed. Snow made from reclaimed water is not to be placed closer than 15 metres to a watercourse or waterbody.

10.9 Dust Suppression and Soil Compaction

Reclaimed water may be used for dust suppression and soil compaction when applied from a tank mounted on a moving vehicle.

General Requirements

The reclaimed water must be applied to the target area only, and runoff from the application must be avoided.

Vehicles used for hauling reclaimed water should be dedicated for this purpose. Drinking water cannot be transported by a truck that has been used to haul reclaimed water.

The vehicle must have signage stating that it uses reclaimed water. Please refer to the Signage, Labelling and Fencing section of this guideline for additional information.

10.10 Industrial Uses

The use of reclaimed water for industrial activities is desirable as many industrial processes are water intensive. Reclaimed water may be used in a number of industrial operations and activities.

Some examples include: aggregate washing, concrete making, equipment washing, cooling towers (excluding evaporative cooling towers), stack scrubbing, boiler feed, process water (excluding food processing), hydraulic fracturing and pressure testing of pipes that will convey anything other than potable water.

General Requirements

Since there are almost unlimited uses for reclaimed water in the industrial sector, the reclaimed water use category, and hence its quality must be determined on a case by case basis. The category is to be determined based on the likelihood of public and worker exposure, and environmental impact.

Design Suggestions

Other industrial uses (e.g., stack scrubbing, boiler feed, processing, cooling towers, equipment washing) may recycle the reclaimed water through the plant. Reclaimed water may be recycled and used repetitively in the same process or in more than one process.

When using reclaimed water to make concrete, the engineer designing the concrete mix must be made aware that reclaimed water will be used in the concrete batch. The same notification is required for aggregates washed in reclaimed water that will be used to make concrete. The intent is to allow the engineer to factor in any potential contaminants which could reduce the quality or long term performance of the concrete.

Worker contact with reclaimed water must be minimised. A higher level of disinfection may be needed when warranted by the likelihood of worker contact. When required due to the intended application, or if required by a health officer, a discharger is also required to monitor daily for *Escherichia coli* (E.coli) and maintain a limit of no more than 1 CFU/100ml or 2 MPN/100ml.

Workplace safety programs should be amended to include proper procedures and hazard and risk assessments for workers using or working around reclaimed water.

Off-spec feed water used in industrial operations may have a negative effect on equipment operation and performance. Of particular concern are iron, copper, silica, and total dissolved solids. Operation and equipment implications should be well understood before using reclaimed water.

The provider of reclaimed water must consult the specific industry's recommended water quality limits for make-up water. An assessment conducted by a qualified professional is required to ensure that the quality of the reclaimed water is acceptable for the industrial use intended.

Regardless of the reclaimed water use category, evaporative cooling towers are not permitted in residential or commercial areas because of concern over pathogen build-up over time.

10.11 Chemical Spraying

Reclaimed water may be used for the purposes of chemical spraying where a sprayer filling station has been set up in accordance with the guidelines set out below. An agricultural producer who is supplied with reclaimed water may establish a sprayer filling station on the farm.

Reclaimed water may be used for chemical spraying with a boom, air blast, wick, or any other recognized application method.

General Requirements

The operator must follow standard protection practices as outlined in the references cited at the end of this section. The sprayer filling station must be:

- located at least 30 metres from any well or in-ground reservoir used for domestic supply purposes
- located at least 10 meters from all watercourses
- clearly bear the message "reclaimed water is used".

Design Suggestions

Maintain an air gap of at least 300mm between the end of the filling hose and the top of the sprayer tank. Where an air gap is not possible, a reduced-pressure-principle backflow device should be installed.

References

- Handbook for Pesticide Applicators and Dispensers - MoE
- Pesticide Applicator Course for Agricultural Producers - MA, MoE, AC
- BC Environmental Farm Plan Reference Guide – BC Agriculture Council

10.12 Fire Fighting

Reclaimed water may be used for both indoor and outdoor firefighting, as detailed below.

General Requirements

Reclaimed water used for firefighting must meet the requirements of the Greater Exposure Potential category where there is a high likelihood of public contact e.g. for fire hydrants. The Moderate Exposure Potential category of reclaimed water may be used where there is a minimal likelihood of public contact or where there is restricted public access and user education is provided.

If the reclaimed water is used for fire prevention or is in an area where the public and firefighters have been evacuated, any category of reclaimed water may be used.

For outdoor fire fighting, fire hydrants using reclaimed water must be specially colour-coded and tagged to identify the water source.

Reclaimed water must not be used for indoor fire suppression sprinklers in food preparation areas such as restaurant kitchens.

Reclaimed water from regular flushing and maintenance of fire hydrants must not be directed into storm sewers, but must be directed into sanitary sewers or fields in rural areas.

Fire fighters and other emergency personnel must be made aware that reclaimed water is being used and special training must be provided to limit exposure potential. Proper personal protective gear must be worn by firefighters and hoses should be sanitised after use.

Only reclaimed water supplies that are available year-round may be used for fire fighting.

Urgent Circumstances

There are special circumstances in which reclaimed water may be approved for use on a short term basis by the MoE regional director without registration under the MWR. Typically, this scenario would only be considered for forest fire fighting or other similar urgent matters, when water resources are limited or unavailable. Approvals in these cases will be considered on a case by case basis.

Fire fighters and other emergency personnel must be made aware that reclaimed water is being used and must be trained or advised on how to limit exposure potential.

References

- Guidelines for Water Reuse, USEPA
- Metcalf & Eddy an AECOM Company, Inc. *Water Reuse: Issues, Technologies and Applications*. USA: 2007.

11. Signage, Labelling and Fencing

Signage and labelling are needed to advise workers and the general public that reclaimed water is being used and that certain precautions are necessary. Fencing is required to control access if needed when irrigating with reclaimed water to help restrict public access.

It is recommended that reclaimed water providers and users seek legal advice on what constitutes due diligence for the placement of signage, labelling and fencing at their respective sites. Some suggestions are provided below.

Signage

Suitable signs bearing the emergency contact phone numbers should be erected at the main entrance to reclaimed water storage reservoirs, evaporation basins, and infiltration sites.

Prominent no trespassing signs should appear around the reclaimed water storage reservoirs advising that the water is not potable. The wording must be in language or symbols readily comprehensible by the general public (e.g., *NO TRESPASSING - RECLAIMED WATER - DO NOT DRINK*).

Prominent no trespassing signs should be erected around agricultural and silvicultural sites irrigated with reclaimed water, warning of the possible health hazard during the irrigation season and advising that the water used for irrigation is not potable. The wording should be in language or symbols that are easily understood by the general public (e.g., *NO TRESPASSING - RECLAIMED WATER - DO NOT DRINK*).

Impoundments should have perimeter signs indicating that the reclaimed water stored is not safe for drinking (e.g., *ATTENTION: RECLAIMED WASTEWATER - DO NOT DRINK*).

At areas irrigated with reclaimed water, warning signs should be posted in sufficient numbers and size and at strategic locations to advise the public that reclaimed water is being used and is not safe for drinking purposes and for the restricted public use category for personal contact as well (e.g., *WARNING -RECLAIMED WATER- AVOID CONTACT - DO NOT DRINK*).

Tank trucks and other equipment which are used to distribute reclaimed water should be clearly identified with warning signs.

Golf score cards and signage posted at visible locations should indicate that reclaimed water is used for irrigation on golf course lands.

Labelling and Identification

Pipes and equipment conveying reclaimed water should be easily identifiable and properly labelled. Piping installations must also conform to the BC Building Code. Reclaimed water piping should be purple in colour, where available.

Where purple piping is not available from suppliers, some other uniquely identifying colour or stripe-coloured pipe may be used. When off coloured pipes are used, it becomes increasingly important to have proper labelling.

All piping and equipment conveying reclaimed water should be labelled to easily identify that reclaimed water is being used. The labeling should be easily readable and understandable by someone not familiar with the operation of the system, or in the case of a building, to someone who may come into contact with the piping, whether it is a trade person or a resident.

Unless indicated otherwise by the BC Building Code, pipe should be labelled with the text “RECLAIMED WATER”. The text should be placed longitudinally (i.e. along the length of pipe) and the font should be sized for easy readability.

Labels should be spaced at reasonable intervals, according to the application, to avoid long lengths of unlabelled piping.

Each text label should also feature an adjacent arrow label to indicate the direction of normal pipe flow.

Fencing

A chain-link security fence at least 6 feet high or functional equivalent is recommended around reclaimed water storage reservoirs to prevent public access. Also, a suitable fence should be erected and maintained around all restricted public areas irrigated with reclaimed water.

12. Monitoring

Effluent and receiving environment monitoring for reclaimed water must follow the requirements of the MWR. In some cases, depending on the system design and configuration, the monitoring requirements for discharges to water and ground may also be applicable.

Monitoring requirements established by the MWR are minimum requirements. A more detailed monitoring regime with greater sampling frequency may be required in some cases, as determined by the EIS, or if required by the MoE regional director.

The EIS must also take into account any additional monitoring that may be required when the contingency options (i.e., storage or alternate disposal method) are in use.

In respect of reclaimed water uses in the greater exposure potential category, daily fecal coliform testing may be reduced to weekly if compliance with the initial 60 day monitoring period is demonstrated.

If fecal coliforms are detected after weekly testing is established, 7 consecutive non-detect tests must be achieved before returning to weekly sampling.

13. Reporting

Ongoing Reporting

Monitoring data reports must be submitted by the registered reclaimed water provider at the frequency defined in MWR according to the reuse classification, or at an alternate schedule approved by the MoE regional director.

Annual Reporting

In addition to regular submissions of monitoring data, providers of reclaimed water must submit an annual report to the MoE regional director.

The report is due within 60 days of the end of the calendar year for that year's monitoring. Raw data, suitably tabulated, are to be attached as appendices to the report.

The report must be in a format suitable for review by public and government agencies, and in an electronic or printed format satisfactory to the director.

The executive summary should concisely summarise effluent and receiving environment monitoring activities from the previous year, highlighting occurrences when the operation was not in compliance with the MWR and the actions taken.

A summary of the following items should be included in the report:

- the results of all sampling and monitoring activities and programs from the past year, including an interpretation of data.
- A summary of the quantity and quality of reclaimed water provided over the past year.
- the projected monitoring schedule for the next year.
- Any non-compliance events and corrective actions taken.
- occurrences where reclaimed water was diverted to an alternate disposal method or to storage.
- a summary of system deficiencies from the past year, including their status (outstanding, addressed or corrected) and the action planned or taken to address the deficiency.
- high level information pertaining to the construction and maintenance activities onsite over the previous year, as well as activities planned for the upcoming year.
- user information and communication materials distributed to users over the past year.
- complaints received during the previous year and how they were addressed.

14. Notification

System Malfunctions and Failure to Meet Reclaimed Water or Effluent Quality Requirements

Providers of reclaimed water are responsible for notifying both the regional director and the local health officer upon first discovery of any event that that could present a health hazard or risk to the environment.

Summary of Notification Requirements in MWR

Note that some of the notification requirements below may not be applicable to all reclaimed water uses. Please refer to the MWR for detailed requirements.

Event (if applicable)	Notification / Submission	Timeline
Change to registration information on file	Notify director, submit revised information.	30 days prior

Transfer of registration	Notify director of intended transfer. Submit revised information, if applicable	30 days prior
Providing reclaimed water	Notify the applicable health officer in writing. Provide proof of the above notification to the director	Notify health officer at least 60 days before registering the proposed use of reclaimed water
Provide audited financial statements of capital replacement fund for the previous year	Submit financial statements to the director	Within 90 days from the end of the discharger's fiscal year
Prior to beginning of discharge	Notify the director that discharge will begin and submit sealed as-constructed design drawings of the facility	Within 30 to 60 days before beginning of discharge
Just after beginning of discharge	Notify the director that discharges have started	Not more than 7 days after beginning to discharge
Prior to bypass which may cause the discharge to fail any requirement of the MWR	Notify director of intent to bypass. Receive authorization to bypass. Comply with bypass conditions imposed by the director. Notify health officer, if there is an increased risk to public health	At least 30 days before start of bypass
Unauthorized bypasses, overflows or spills	Report in accordance with the Spill Reporting Regulation Notify health officer, if there is an increased risk to public health.	Report in accordance with the Spill Reporting Regulation

System malfunction which may cause the discharge to fail any requirement of the MWR, or which may result in potential harm to public health	Notify director and health officer	Immediately
Failed routine toxicity test	Notify director Notify health officer, if there is an increased risk to public health.	Immediately
Assurance plan coverage ending	Notify director	Within 30 days of coverage ending
Annual report for discharges serving populations greater than or equal to 10,000 or for use of reclaimed water	Submit annual report to director	Prior to May 1 of each year for discharges serving greater populations

15. Record Keeping

Authorised providers and dischargers of reclaimed water should maintain historical records of monitoring data and operation and maintenance activities.

16. Plans

A guidance document to assist with the development of plans required under MWR is currently being drafted. When available, the document will be hosted at the following URL:

<http://www.env.gov.bc.ca/epd/mun-waste/regs/mwr/guidance/index.htm>

For reclaimed water registrations under MWR, plans detailing the following may be required:

- commissioning
- operating
- contingency
- irrigation
- closure

17. Communications

MWR Communication Requirements

Under the MWR, a provider of reclaimed water must develop information and communication materials related to the use of the reclaimed water, and provide copies annually to all users.

Providers are responsible for providing end users with appropriate training, documentation, information and guidance on how to safely and properly use reclaimed water for the intended purpose, unless an agreement is in place which delegates this responsibility to the end user.

Providers should maintain regular communication with users of reclaimed water and provide updated procedures, fact sheets and notification anytime a change is proposed that could affect the end user.

General Communication Considerations

Communication is essential to ensuring safe use of reclaimed water and maintaining positive relationships with end users and the public.

Providers are encouraged to develop a communications plan or strategy. In some cases, it may be beneficial to retain the services of an experienced communications consultant for this purpose.

A strategy will attempt to determine the following:

- What do we know about the customers who will be affected by the introduction of reclaimed water usage? Can we identify them specifically?
- What communication have we had so far with this group?
- What information do we have on this group's perception and understanding of reclaimed water issues? How have we reacted, to date, to their level of understanding?
- How can we alleviate the potential for negative reactions to the proposed use of reclaimed water (within the immediate community and further afield)?
- How can public acceptance be fostered proactively, before potentially negative reactions can take hold?
- Is the timing current? Are we at the front end of the issue or following already-formed public perception?

Some considerations for a successful communication strategy and plan:

- start public education early
- establish an adequate communications budget
- identify target audiences, including all groups and any specific interests
- ensure on-going public education and outreach
- know your audience
- create a simple, clear message
- frame the issues with care

- use polling
- develop a wide array of communication tools.

18. Contact Information

BC Ministry of Environment

Regional Offices (for inquiries on new registrations and existing authorisations):

<http://www.env.gov.bc.ca/epd/main/regions.htm>

Victoria Office (for all policy, legislative and regulatory inquiries):

<http://www.env.gov.bc.ca/epd/main/contact.htm>

Online Registration Guidance:

<http://www.env.gov.bc.ca/epd/mun-waste/regs/mwr/guidance/reg-msd.htm>

BC Ministry of Health

<http://www.gov.bc.ca/health/>

BC Health Authorities

<http://www.health.gov.bc.ca/socsec/>

BC Ministry of Agriculture

<http://www.gov.bc.ca/agri/>

BC Office of Construction and Housing Standards (Ministry of Energy, Mines and Natural Gas)

For inquiries on the BC Building Code (including BC Plumbing Code)

<http://www.housing.gov.bc.ca/>

19. Additional Resources

Ministry of Agriculture

- Chemigation Guidelines for British Columbia
- Irrigation System Cross Connection Control
- B.C. Frost Protection Guide
- Using Irrigation for Tree Fruit Cooling
- Guide to Irrigation System Design with Reclaimed Water
- Irrigation Scheduling Techniques
- Irrigation Scheduling with Tensiometers
- Evapotranspiration Rates for Turf Grass in B.C.

- The BC Sprinkler Irrigation Manual
- The BC Trickle Irrigation Manual
- Irrigation Management Guide

Irrigation Industry Association of British Columbia

www.irrigationbc.com

- Landscape Sprinkler Irrigation Scheduling Calculator and User Guide. There are two guides available, Landscape Drip and Landscape Sprinkler
- Agriculture Irrigation Scheduling Calculator and User Guides There are a number of guides available including, pivot, travelling gun, stationary gun, sprinkler and drip

Other

- Handbook for Pesticide Applicators and Dispensers (MoE)
- Pesticide Applicator Course for Agricultural Producers (AC, MA, MoE, AC)
- *BC Environmental Farm Plan Reference Guide* - BC Agriculture Council
- Guidelines for Water Reuse(USEPA)

20. List of Acronyms

AC	Agriculture Canada
EMA	BC <i>Environmental Management Act</i>
BCAC	BC Agriculture Council
IIABC	Irrigation Industry Association of BC
LWMP	Liquid Waste Management Plan
AGRI	BC Ministry of Agriculture
MoE	BC Ministry of Environment
MoH	BC Ministry of Health
MWR	Municipal Wastewater Regulation
USEPA	US Environmental Protection Agency